

CLAIMS

1. (Original) A solid state device comprising:

a first material;

a second material;

a barrier layer formed between the first material and the second material to prevent diffusion between the first material and the second material, the barrier layer includes a metal form of at least one of Ru and Re.

2. (Original) The device as recited in claim 1, wherein the metal form includes a hexagonal close packed structure.

3. (Original) The device as recited in claim 1, wherein the first material is a dielectric and the second material is a metal.

4. (Original) The device as recited in claim 1, wherein the first material is a conductor and the second material is a metal.

5. (Original) The device as recited in claim 1, wherein the first material includes copper.

6. (Original) The device as recited in claim 1, wherein the metal form includes a single metallic phase in a temperature range of between about 300 degrees C and about 550 degrees C.

7. (Original) The device as recited in claim 1, wherein the metal form includes a single

metallic phase in a temperature range of between about 300 degrees C and about 900 degrees C.

8. (Original) The device as recited in claim 1, wherein device is a semiconductor device and the first material includes a semiconductor material.

9. (Original) The device as recited in claim 1, wherein the barrier layer includes a thickness of 700 Angstroms or less.

10. (Original) A method for fabricating a semiconductor device, comprising the steps of:
providing a structure having a first material formed thereon;
forming a barrier layer over the first material wherein the barrier layer comprises at least one of Re and Ru in a metallic phase; and
forming a second material over the barrier layer to prevent diffusion between the first and second materials.

11. (Original) The method as recited in claim 10, wherein the metallic phase includes a hexagonal close packed structure.

12. (Original) The method as recited in claim 10, wherein the first material is a dielectric and the second material is a metal.

13. (Original) The method as recited in claim 10, wherein the first material is a conductor and the second material is a metal.

14. (Original) The method as recited in claim 10, wherein the first material includes copper.

15. (Original) The method as recited in claim 10, wherein the step of forming a barrier layer includes depositing the barrier layer at a temperature below 400 degrees C.

16. (Original) The method as recited in claim 10, wherein the step of forming a barrier layer includes depositing the barrier layer at a temperature of about 300 degrees C.

17. (Original) The method as recited in claim 10, wherein the step of forming a barrier layer includes depositing the barrier layer by employing a chemical vapor deposition process.

18. (Original) The method as recited in claim 10, wherein the step of forming a barrier layer includes employing a metal carbonyl as a precursor.

19. (Original) The method as recited in claim 18, wherein the metal carbonyl includes at least one of $\text{Ru}_3(\text{CO})_{12}$ and $\text{Re}_2(\text{CO})_{10}$

20. (Original) The method as recited in claim 10, wherein the step of forming a barrier layer includes depositing the barrier layer at a thickness of 700 Angstroms or less.